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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/757,392	01/15/2004	You-seop Lee	249/438	4957

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EXAMINER	
WEINSTEIN, LEONARD J	
ART UNIT	PAPER NUMBER
3746	
MAIL DATE	DELIVERY MODE
11/13/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/757,392	LEE ET AL.	
	Examiner	Art Unit	
	LEONARD J. WEINSTEIN	3746	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 September 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-9 and 11-20* is/are pending in the application.

4a) Of the above claim(s) *2 and 10* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-9 and 11-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on September 5, 2008 has been entered.

2. The examiner acknowledges the amendments to claims 1 and 4.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claims 1, 4, 6-8, 17 and 20 rejected under 35 U.S.C. 103(a) as being unpatentable over the printed publication of TSAI et al., "A Thermal Bubble Actuated Micro Nozzle-Diffuser Pump", The 14th IEEE International Conference on Micro Electro

Mechanical Systems, Interlaken, Switzerland, Jan. 21-25, 2001. With reference to the titles of the individual elements shown in the schematic of figure 2, Tsai teaches all the limitations as claimed for a micro-pump including: **[claim 1]** a pumping chamber (Pumping Chamber) to be filled with a fluid, at least one fluid entrance (Liquid Outlet) and at least one fluid exit (Liquid Inlet), each one of the fluid entrance (Liquid Outlet) and fluid exit (Liquid Inlet) being connected directly between the pumping chamber (Pumping Chamber) and a respective manifold (not shown), a heating element (Aluminum Heater) at one side of the pumping chamber (Pumping Chamber) to generate bubbles in the pumping chamber (Pumping chamber) by heating the fluid, and electrodes (second sentence in the first paragraph under "Conclusions") for applying current to the heating element (Aluminum Heater), wherein a fluid flow into or out of the pumping chamber (Pumping Chamber) is by expansion and contraction of the bubbles, and wherein a cross-sectional area of each of the fluid entrance (Liquid Outlet) and the fluid exit (Liquid Inlet) varies along a direction of the fluid flow to have a constant inclination angle along its entire length (figure 1), respectively, and wherein the cross-sectional area of the fluid entrance (Liquid Inlet) decreases (via the Diffuser Valve) in a direction toward the pumping chamber (Pumping Chamber), and the cross-sectional area of the fluid exit (Liquid Inlet) increases (via the Nozzle Valve) in a direction toward the pumping chamber (Pumping Chamber); **[claim 6]** a fluid entrance (Liquid Outlet) is provided at one side of the pumping chamber (Pumping Chamber) and the fluid exit (Liquid Inlet) is provided at an opposite side of the pumping chamber (Pumping Chamber) to face the fluid entrance (Liquid Outlet); **[claim 7]** each of the fluid entrance

(Liquid Outlet) and the fluid exit (Liquid Inlet) has a pyramid shape (see figure 1); **[claim 8]** each of the fluid entrance (Liquid Outlet) and the fluid exit (Liquid Inlet) has a uniform height and a width varying in the direction of the fluid flow (see figure 1); **[claim 17]** a heating element (Aluminum Heater) is outside the pumping chamber (Pumping Chamber); **[claim 20]** and a central axis along a length of each one of the fluid entrance (Liquid Outlet) and fluid exit (Liquid Inlet) is parallel to a bottom surface of the pumping chamber (Pumping).

The publication of Tsai further teaches the following limitations for a micro-pump including (again with reference to the reference titles in figure 2) : **[claim 4]** a pumping chamber (Pumping Chamber) to be filled with a fluid, at least one fluid entrance (Liquid Inlet) and at least one fluid exit (Liquid Outlet), each one of the fluid entrance (Liquid Inlet) and fluid exit (Liquid Outlet) being connected directly between the pumping chamber (Pumping Chamber) and a respective manifold (not shown), a heating element (Aluminum Heater) at one side of the pumping chamber (Pumping Chamber) to generate bubbles in the pumping chamber (Pumping Chamber) by heating the fluid (see "Abstract"), and electrodes (see second sentence in the first paragraph under section "Conclusions") for applying current to the heating element (Aluminum Heater), wherein a fluid flow into or out of the pumping chamber (Pumping Chamber) is by expansion and contraction of the bubbles (see "Abstract), and wherein a cross-sectional area of each of the fluid entrance (Liquid Inlet) and the fluid exit (Liquid Outlet) varies along a direction of the fluid flow to have a constant inclination angle along its entire length, respectively, wherein the cross-sectional area of the fluid entrance (Liquid Inlet)

increases in a direction toward the pumping chamber (Pumping Chamber), and the cross-sectional area of the fluid exit (Liquid Outlet) decreases in a direction toward the pumping chamber (Pumping Chamber) and wherein each of the pumping chamber (Pumping Chamber – as shown in figure 2)) and the heating element (Aluminum Heater – as shown in figure 3 (b) and characterized "meander-shaped" in the second paragraph under the section "Device Structure and Fabrication") has a circular shape.

The examiner notes that the device disclosed in the Tsai publication has been interpreted two different ways and applied to each of the independent claims 1 and 4. The examiner has interpreted the Liquid Inlet and Liquid Outlet to each function as an entrance and an exit. Each component inherently accomplishes both functions at different times during operation. The interpretations presented by the examiner find support in the disclosure of Ma US 6,655,924 in column 1, lines 43-56, which states that backflow occurs in both an inlet and outlet of a micro-pump such as the one disclosed in the cited publication.

The publication of TSAI et al., "A Thermal Bubble Actuated Micro Nozzle-Diffuser Pump", The 14th IEEE International Conference on Micro Electro Mechanical Systems, Interlaken, Switzerland, Jan. 21-25, 2001 does not teach a fluid entrance that is connected directly between an inlet manifold and a pumping chamber or a fluid exit connected directly between the pumping chamber and an outlet manifold to that a micro-pump is configured to produce a net flow from a fluid entrance to a fluid exit as they have been interpreted here where in the fluid entrance has been construed as the Liquid Outlet of Tsai, and the fluid exit has been construed as the Liquid Inlet of Tsai.

The examiner notes that the applicant has set forth limitations that define over the subject matter in the publication cited from the standpoint of a configuration. The micro-pump of the instant application and claims 1 and 4, produces a net flow via an inlet that has a cross-section the converges, like a nozzle, towards a pump chamber, and an outlet that has a cross section that converges in a direction away from a pumping chamber so that essentially an outlet nozzle is formed. As disclosed by the applicant the structure of the pump is not novel and in fact the instant invention uses basically the same fluid port and pump chamber configuration as the prior art. The exception being that a supply of fluid is introduced initially into the conduit that was connected to what was formerly the fluid outlet. In effect the pump is same in structure and basic function but the prior art teaches connecting a supply to the conduit that is taught by the instant invention to now be a fluid exit. Switch the supply of a pump to basically reverse the net flow amounts to a basic reversal of parts. The Tsai publication discloses the claimed invention except for a fluid supply connected to a fluid inlet that has a cross-section that converges towards a pump chamber, instead teaches a supply line connected to what the fluid exit of the invention that is claimed. It would have been obvious to one having ordinary skill in the art at the time the invention was made to switch a fluid supply from what was formerly fluid inlet to what was formerly a fluid exit (now serving as the fluid inlet). It has been held that a mere reversal of the essential working parts of a device involves only routine skill in the art. In re Einstein, 8 USPQ 167.

6. Claims 3 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over the printed publication of TSAI et al., "A Thermal Bubble Actuated Micro Nozzle-Diffuser

Pump", The 14.sup.th IEEE International Conference on Micro Electro Mechanical Systems, Interlaken, Switzerland, Jan. 21-25, 2001.

With respect to claim 3, Tsai discloses the general conditions of the claimed invention except for the express disclosure of a fluid entrance and a fluid exit formed to have an inclination angle of about 50° to about 70°. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a fluid entrance and a fluid exit for a micro-pump, formed to have an inclination angle of about 50° to about 70°, since the claimed values are merely an optimum or workable range.

With respect to claim 5, Tsai discloses the general conditions of the claimed invention except for the express disclosure of a fluid entrance and a fluid exit formed to have an inclination angle of about 30° or less. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a fluid entrance and a fluid exit for a micro-pump, formed to have an inclination angle of about 30° or less, since the claimed values are merely an optimum or workable range.

It has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

7. Claims 1, 6-9, 11-16, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baughman et al. US 5,387,314 as evidenced by Hertz US 4,196,437. Baughman teaches all the limitations as claimed for a micro-pump including: **[claim 1]** a pumping chamber 15 to be filled with a fluid, at least one fluid entrance 14b connected directly between an inlet manifold 18 and the pumping chamber 15, a fluid exit 20, being

capable of being connected directly between the pumping chamber 15, as shown in figure 1, and an outlet manifold (such a as container instead a of a print medium), a heating element 16 (col. 4 ll. 1-4) at one side of the pumping chamber 15 to generate bubbles in the pumping chamber 15 by heating the fluid, and electrodes (col. 5 ll. 65-67) for applying current to the heating element 16, the micro-pump configured to produce a net flow from the fluid entrance 14b to the fluid exit 20, wherein a fluid flow into or out of the pumping chamber 15 is by expansion and contraction of the bubbles, and wherein a cross-sectional area of each of the fluid entrance 14b and the fluid exit 20 varies along a direction of the fluid flow to have a constant inclination angle along its entire length, respectively, and wherein the cross-sectional area of the fluid entrance 14b decreases in a direction toward the pumping chamber 15, and the cross-sectional area of the fluid exit 20 increases in a direction toward the pumping chamber 15; **[claim 6]** a fluid entrance 14b is provided at one side (bottom) of the pumping chamber 15 and the fluid exit 20 is provided at an opposite side (top) of the pumping chamber 15 to face the fluid entrance 14b; **[claim 7]** a fluid entrance 14b and the fluid exit 20 has a pyramid shape, as shown in figures 1 and 2a; **[claim 8]** a fluid entrance 14b and the fluid exit 20 has a uniform height and a width varying in the direction of the fluid flow, as defined by the direction of flow through each of elements 14b and 20 respectively; **[claim 9]** a micropump 10 including the pumping chamber 15 and the heating element 16 formed in a hexahedral shape, element 16 is formed in the shape of a cuboid and element 15 where a at least of portion of which between element 24 and the section where element 14 begins is in the shape of a modified quadrilateral frustum; **[claim 11]** a heating

element 16 is formed of a resistive heating material (a resistor as disclosed); **[claim 12]** a substrate 12 surrounding portions of the pumping chamber 15, the fluid entrance 14b, and the fluid exit 20; **[claim 13]** an insulation layer 26 between the substrate 12 and the heating element 16, the insulation layer 26 being in communication with the fluid in the pumping chamber 15; **[claim 14]** a passivation layer 26 (as element 26 is disclosed as both a "passivating layer" and a "in-sulating dielectric layer" - col. 6 ll. 38-48) on the heating element 16 and the electrodes (col. 5 ll. 64-67); **[claim 15]** a heat dissipation layer 17 formed on the passivation layer 26 for dissipating heat, wherein the heat dissipation layer 17 is connected to the substrate 12, as shown in figure 6D; **[claim 16]** a heat dissipation layer 17 is formed of a metal; **[claim 18]** and one of the fluid entrance 14b and the fluid exit 20 includes a surface slanted at an angle with respect to a bottom surface of the pumping chamber 15 (element 20). Baughman does not teach a fluid exit that is directly connected to an outlet manifold. However Hertz teaches that is was known in the art to use a similar liquid jet nozzle as taught by Baughman in order to mix primary and secondary fluid in a container (manifold). It would have been obvious to one having ordinary skill in the art at the them the invention was made to use the pump and nozzle assembly, as taught by Baughman, and connect it to a manifold, as taught by Hertz in order provide an improve method for forming ink droplets (Hertz col. 3 ll. 32-35).

8. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Baughman US 5,387,314 as evidenced by Hertz 4,196,437. Baughman discloses the general conditions of the claimed invention except for the express disclosure of a fluid

entrance and a fluid exit formed to have an inclination angle of about 50° to about 70°. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a fluid entrance and a fluid exit for a micro-pump, formed to have an inclination angle of about 50° to about 70°, since the claimed values are merely an optimum or workable range. It has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

9. Claim 16 rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Baughman et al. US 5,387,314 as evidenced by Hertz 4,196,437, as applied to claim 15 above, and further evidenced by Takahashi et al. US 6,428,875. Baughman teaches all the limitations as claimed including a layer of photopolymerizable material (col. 3 ll. 59-61) that is etched/developed to form a pattern opening with element 17. As evidenced by Takahashi, metallocene is a known photopolymerizable material used in printer technology to form pattern layers of material (Takahashi – col. 8 ll. 25-67; col. 9 ll. 1-12). Further, it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

10. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Baughman US 5,387,314 as evidenced by Hertz 4,196,437. Baughman teaches the claimed invention except for providing a heating element outside of a pumping chamber. It would have been obvious to one having ordinary skill in the art at the time the invention was provide a heating element outside of pump chamber in order to eject

droplets of ink through a nozzle (Baughman – col. 3 ll. 66-col. 4 ll. 4). It has been held that rearranging parts of an invention involves only routine skill in the art. In re Japikse, 86 USPQ 70.

11. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Baughman US 5,387,314 as evidenced by Hertz 4,196,437, as applied to claim 13 above. Baughman teaches the claimed invention except for providing an insulation layer on an upper wall of a pump. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide an insulation layer on an upper wall of a pump in order to provide an insulating dielectric layer in a micro-pump (Baughman - col. 6 ll. 38-48). It has been held that rearranging parts of an invention involves only routine skill in the art. In re Japikse, 86 USPQ 70.

Response to Arguments

12. Applicant's arguments with respect to claims 1-20 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LEONARD J. WEINSTEIN whose telephone number is (571)272-9961. The examiner can normally be reached on Monday - Thursday 7:00 - 5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Devon Kramer can be reached on (571) 272-7118. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Devon C Kramer/
Supervisory Patent Examiner, Art Unit 3746

/Leonard J Weinstein/
Examiner, Art Unit 3746